

# NASA TECH BRIEF

## *Marshall Space Flight Center*



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### Program for Standard Statistical Distributions

#### The problem:

There are certain statistical distribution functions which, for theoretical and practical reasons, occupy a central position in statistical theory. Because of the many forms assumed by frequency distributions, a logical, efficient procedure to describe those of importance would be desirable.

#### The solution:

This program uses two approaches, one theoretical and the other empirical. These are presented as three options: option A for the theoretical and options B and C for the empirical.

#### How it's done:

Program option A is the Pearson system of frequency distributions developed by Karl Pearson. Pearson claimed that all the different types of frequency distributions that arise in practical statistics can be represented by the solutions of a first order differential equation:

$$dg(x) = \frac{(x - a) g(x)}{b_0 + b_1 x + b_2 x^2 + \dots}$$

The classification of the various types of distributions is based upon the evaluation of the "Pearson parameters." These parameters are a function of the sample moments. This part of the program computes central and non-central sample moments up to order eight. The parameters are computed, and the program chooses the

appropriate Pearson distribution type based upon the evaluation of these parameters. Appropriate variances and standard deviations of the Pearson parameters also are computed. This option also computes and prints required sample statistics including sample means, variances, standard deviations, and the cumulative distribution function.

Options B and C of the program "fit" the sample input with specified known theoretical distributions. This is a straightforward approach to the problem. Option B includes continuous distributions and option C includes discrete distributions. Included in each distribution fit are expected frequencies, expected cumulative probability function, estimated parameters, and "goodness of fit" tests.

#### Notes:

1. This program is written in FORTRAN V for use on the UNIVAC-1108.
2. Inquiries concerning this program should be directed to:

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